To Tom P.

Chevron Resources Company
A division of **Chevron Industries, Inc.**
Manila Star Route, Vernal, UT 84078 • Phone (801) 789-2233

December 19, 1983

JNHM
DEC 22 1983

Mr. James Smith
Coordinator of Mined Land Development
Utah Division of Oil, Gas & Mining
4241 State Office Building
Salt Lake City, UT 84114

Dear Mr. Smith:

This is in response to your letter of December 9, 1983 requesting additional information required for final approval of the Vernal Phosphate Mine Plan. I have prepared the information on revised pages which can be inserted directly into the document submitted on August 31, 1983. Below is a cross-reference of items requested by you with Chevron's response.

Item 1	Revised, Page 15
Item 2	Revised Page 20
Item 3	Revised Page 4
Item 4	Appendix V, Amendment a, 12/19/83
	Appendix V, Amendment b, 12/19/83
	Appendix V, Amendment c, 12/19/83
	Appendix V, Revision, 12/19/83
Item 5	Revised Pages 14 & 27
Item 6	Revised Page 18
Item 7	Revised, Page 14
Item 8	Revised, Page 26
Item 9	Revised, Page 26

Also included is a Revised Page 29 containing additional information concerning the french drain. Figure 8 has also been updated and re-submitted. As requested by P. Grubaugh-Littig, DOGM, I am preparing additional data concerning the Reclamation Contact that will enable us to upgrade the amount of bonding required. This will be ready by mid-January, 1984.

Should you have any additional questions or comments, please notify me.

RECEIVED
DEC 23 1983
DIVISION OF
OIL, GAS & MINING

Sincerely,

O.L. Fyock
Environmental Specialist

OLF:jl

enclosures

cc: T. Portle, DOGM
R.D. Haddenham, Chevron Resources

Table 1. Estimated yearly ore and topsoil recovery and subsequent disturbance, 1983-1987.

Year	Overburden (Million Tons)	Raw Ore (Million Tons)	Topsoil (Cu. Yards)	Disturbance (Acres)
1983	2.8	1.50	26,540	26.5
1984	2.8	1.50	28,040	28.0
1985	2.49	1.51	23,935	23.9
1986	2.39	1.45	24,435	24.4
1987	2.7	1.65	27,840	27.8
Total	13.18	7.61	130,790	130.6

Note: Average depth of topsoil (7.5") from Native Plants and Chevron samples.
(1 cu. yd. topsoil=2800#)

canopy 28 percent of the total area. Annual production under normal precipitation, averages 1,150 pounds dry-air weight per acre. Refer to Appendix IV for more detail; (This Appendix consists of a reclamation study conducted for Chevron by Native Plants, Inc. (1982) and addresses areas for future development as well as the mine as it exists today.).

As discussed in Section I, Production Operations, approximately 25 acres of land annually will be stripped of vegetation over the next 5 years. During mid-summer and prior to the stripping, vegetative analysis will be conducted to determine if there is any variance from the original baseline data collected by Native Plants, Inc.. The "hoop weight" method may be used to determine production per acre and random vegetative transects or ocular analyses will be conducted to determine the percent coverage. Analysis will be done according to the guidelines for vegetative analysis set forth in the Forest Service Range Analysis Handbook.

Yearly analysis of all reclaimed areas will be conducted during late summer to evaluate success for bonding release. Until more conclusive evaluations of success possibilities can be determined, successful reclamation will have been achieved when ground cover is approximately 70% of that which was determined for the particular area prior to pre-stripping (Rule M-10(12)(2)(a)). Also the vegetation initiated on the area to be released must 1) have survived at least 3 growing seasons, 2) be evenly distributed and 3) not supported by irrigation or soil amendments.

2. Soils

The soils occurring in the proposed mine areas primarily comprise: 1) a moderately-deep and well-drained gravelly loam and 2) a shallow and well-drained complex gravelly loam, rock outcrop and other soils. The gravelly loam exhibits relatively low organic contents, effective rooting depths of about 40 inches, medium surface runoff and high erosion hazard. The variant-rock outcrop complex exhibits similar characteristics, although the effective rooting depth is 10-20 inches and erosion hazard is only moderate. Refer to Appendix IV for details of the soils present.

Soil samples obtained both by Native Plants and Chevron (Appendix V) for the mine area were subjected to various laboratory tests in accordance with the written and verbal guidance of the State of Utah, Division of Oil, Gas and Mining (D.O.G.M.). The results of these tests show that all soils in the mine area are within acceptable ranges, relative to topsoil suitability criteria established for evaluation. These results, included in Table 3, indicate soil pH in the

Table 3. Topsoil suitability criteria and existing conditions.

Parameter	Suitability		[1]Range For Chevron Soils
	Good	Fair	
Carbonates ($CaCO_3$-%)	0-15	15-30	0-30
Electrical Conductvity (EC)	0-4	4-8	0.10-0.70
Molybdenum (Mo-ppm)	1.0		1.0
Nitrogen (NO_3-ppm)	NA*		NA*
Organic Matter (%)	NA*		NA*
Phosphorus (PO_4-ppm)	NA*		NA*
pH (activity at 25°C)	5.5-7.8	4.5-5.5; 8-8.4	6.19-8.36
Saturation (%)	25-80	80;25	27-59
Selenium (Se-ppm)	2.0		0.1-1.0
Sodium Absoprtion Ratio	6	6-10	1
Texture (USDA class.)**	vfsl,fsl,sl,l,sil	lfs,ls,cl,scl,sicl	sl,sil,scl,l,cl

*NA = not applicable

**sl=sandy loam, l=loam, sil=silty loam, scl=sand clay loam, vfsl = very fine sandy loam, fsl - fine sandy loam, cl - clay loam, sicl = silty clay loam, sc - sandy clay, ls = loamy sand, lfs = loamy fine sand

Table 5. Topsoil stockpile inventory, 1983.

	Area Designated for Redistribution	Estimated Volume Cu. Yd.	Acreage Possible w/ 3" Coverage	Actual Acreage of Disturbance
Topsoil Stockpile No. 1	Last 25 acre block in Panel "C" to be mined	10,000	25.00	25
Mackentyre Stockpile No. 1	Panel "A"	2,500	6.25	50+
Mackentyre Stockpile No. 2	Lower Panel "C" (Access Area)	2,000	5.00	20
Total Existing Storage		14,500cu.yd	36.25	90

Note(1): Beginning in late 1983 & early 1984 stockpiling will not be employed. Topsoil will be stripped and immediately relaid for reclamation. Refer to the Mining Section.

Note(2): The above topsoil inventory presents a topsoil deficit of nearly 60 acres even using a 3-inch deep soil cover which may or may not be sufficient. During the summer of 1984, duplicate test plots will be established to determine if 3 inches of topsoil will be sufficient. Test plots were initiated in 1982 to determine the effects of mixing topsoil with overburden, tailings and MacIntyre Tongue for topsoil development. These studies will be continually evaluated and utilized in developing revegetation techniques. Also during the summer of 1984 an inventory and map of McIntyre Tongue deposits on the property will be made to develop borrow areas of this substitute material, should the on-going studies continue to demonstrate its benefit. Chevron will continue to monitor areas where McIntyre Tongue has been used in conjunction with straw mulch.

reestablished slopes exceed a steepness of 2H:1V then the distance between the furrows will be shortened to 25-50 feet. These furrows will only be 3 to 4 feet wide and 1 to 2 feet deep. They will serve to slow surface flow, help maintain finer organic and inorganic materials in the growth medium, and help retain moisture on site to promote plant growth. Their anticipated life is 3 to 5 years. The furrows will direct flow toward reestablished drainages. However, these smaller furrows will not carry sufficient quantities of water for their slope to be critical. Larger furrows will increase the steepness of the slope and such should be avoided.

On very gentle slopes ripping may be done through the replaced topsoil and into the overburden approximately 6 to 12 inches. This ripping will be done against the slope with 8 to 12 foot intervals and will serve the same purpose as the furrows mentioned above.

Samples of redistributed topsoil will be obtained immediately following the final spreading and grading. Should the analysis indicate deficiencies fertilizing and/or mulching will be employed; this is discussed in more detail with sections IV-5 and IV-6.

from Highway 44. Major drainages and strips crossing the mining panels will receive transplants to assist in reestablishing escape cover and forage.

Two transplant mixes will be used, Woodland and Mountain Shrub (Table 8). The woodland mix will be used at lower elevations, roughly corresponding to areas dominated by Utah juniper in the premining vegetation, while the mountain shrub mix will be used at higher elevations, roughly corresponding to areas dominated by sagebrush in the premining vegetation. The overall stocking rate of these areas is 100 plants/acre. The outplantings will be clumped to increase vegetation diversity. Some species which are also included in seed mixtures have been included at low stocking rates to serve as mother plants for seeds in case inadequate moisture conditions result in poor success from direct seeding. Depending on the success of direct seedings, rates of these species may be altered. If, after three years 50% of the seedlings survived, the planting will be considered successful. Re-planting will be considered on a case by case evaluation with DOGM input. All plantings will be done as soon as the spring thaws occur.

Normally the seed mixes will be drill seeded at 1/2 inch depths with a Laird rangeland drill. Legume and small smooth seed will be placed in the small hoppers and will be calibrated independently from the grass seed placed in the large hopper. Shrub seed which may be too "furry" (e.g., winterfat) will either be broadcast seeded and harrowed, or the drill will be equipped with trashy seed pickers and 2 inch dispensing hoses. Extremely small seed (e.g., sagebrush) will be broadcast seeded and harrowed if success from drill seeding is low. Broadcast seeding will be at 1 1/2 times the rate of drill seeding.

5. Mulching

Many questions remain relative to the cost effectiveness of mulching, however slopes exceeding 2H:1V will be straw mulched at a rate of at least 2,000 lbs/acre and crimped, if possible, or tacked. Biodegradable 1 inch mesh screen, in conjunction with mulching, may be used in certain locations where it is not practical to bring in heavy equipment for contouring or hydromulching. This mesh has been successfully used near the Big Brush Creek Crossing, at the facility, and proven a good slope stabilizing tool, as well as holding mulch and seed in place.

6. Fertilization

Soil tests show macronutrients, particularly nitrogen (N) and phosphorus (P), to be deficient even in native undisturbed soils, the mixing of this soil with subsoil and other material will further dilute these macronutrients. The sudden drain on

the limited nutrient supply caused by seeding establishment will further deplete this resource, therefore, initial fertilization will be provided. Long term maintenance by fertilization is not desirable and should not be necessary, especially with the inclusion of legumes. The reestablished vegetation communities should be self-sustaining. Nitrogen can promote weed growth and can be readily leached from the root zone, therefore, the timing of nitrogen applications is important. Fifty pounds of nitrogen per acre will be applied during the spring (April), 12-18 months after initial seeding. This will allow for initial germination and establishment and give the desirable vegetation a year advantage over annual weeds such as Russian thistle (Salsola kali), summer cypresss (Kochia scoparia), and halogeton (Halogeton galomeratus). Phosphorus, which is less mobile, will be applied during spring or fall at a rate of 50 lbs/acre of P_2O_5.

Fertilizer application on existing vegetation (i.e. 2nd year growth) will be conducted in early spring or late fall. Where possible, a rubber tired tractor with a broadcaster will be utilized. Other areas may require the use of a chest cyclone broadcaster.

maximum size of approximately 4 feet or more and no more than 15% of the coarse zone will be less than 2 inches in diameter. Incoming sediments pass into the coarse overburden, where reduced flow velocities cause sediment to eventually settle out. This behavior can be expected to continue well beyond the time required for watershed reclamation, before gradual build-up of sediment will obstruct flow and the surface drainage pattern is restored. As revegatation progresses, less runoff will occur from the watershed.

Past experience has also shown that it may take several months or years before the water will emerge at the mouth of the overburden fill. For instance, during the spring of 1983 the Hole-in-the-Wall drain began receiving water as early as the second week of March but did not emerge until April 26, 1983. By June 5, 1983 the flow had stopped. Water samples were taken and are presented in Section VI, Water Quality.

Hole-in-the Wall Canyon penetrates the Weber sandstone which is a thick (1000'±) tightly compacted formation with a low permiability rate. The formation extends at least 500 feet below the lowest portion of the canyon. As run-off water infiltrates the canyon's french drain, the overburden must become saturated before water will flow from the outlet. Since the Weber is a much tighter foundation than the overburden, very little water penetrates it, thus there is little, if any effect upon aquifiers below the Weber.

APPENDIX V

SOIL SAMPLE INDEX TO LAB ANALYSIS REPORT

SAMPLE SITE	NATIVE PLANTS, INC. MAY 1982 (COLLECTED BY NPI)		UTAH STATE UNIV. MARCH 1983 (COLLECTED BY CHEVRON)
C1	C1	000001	C105-108-83
C2	C2a	000002	C0204-115-83
C2	C2b	000003	
C3	C3	000004	C304-108-83
C4	C4	00005	C0402-115-83
C4			C0404-115-83
C4			CO406-115-83
C5	C5	000006	C503-108-83
C6	C6a	000007	C608-108-83
C6	C6b	000008	
C7	C7	000009	C712-108-83
C8	C8a	0000010	C808-108-83
C8	C8b	0000011	
C9	c9	0000012	C903-108-83
C10	C10a	0000013	C1004-108-83
	C10b	0000014	
	C10c	0000015	
C11	C11a	0000016	C1104-108-83
C11	C11b	0000017	C1106-108-83
C11	C11c	0000018	C118-108-83
C11	C11d	0000019	C1118-108-83

Note: Chevron Samples were collected as close to original site of Native Plants sample as possible:

Amendment A, 12/19/83

SUMMARY OF SOIL SAMPLES OBTAINED IN PANEL "C"
BY NATIVE PLANTS, INC., MAY 1982

SAMPLE SITE	NO_3-N PPM	ORGANIC MATERIAL	PHOSPHATE PPM	POTASSIUM PPM
C1	1.10	2.0	0.2	160
C2	0.80	2.7	0.21	185
C2	0.5	2.3	0.06	140
C3	0.75	3.4	0.20	170
C4	1.45	3.9	0.28	105
C5	1.00	2.0	0.29	185
C6	1.35	3.2	0.44	200
C6	0.75	2.9	0.20	110
C7	0.85	3.0	0.32	155
C8	0.90	2.9	0.36	210
C8	0.90	2.4	0.20	135
C9	0.85	3.3	0.91	205
C10	0.60	3.6	0.64	270
C10	1.10	3.2	0.78	250
C10	0.70	3.0	0.61	230
C11	2.30	5.7	1.16	305
C11	0.80	4.3	0.44	220
C11	0.75	3.7	0.36	215
C11	0.85	3.6	0.40	230

Note: Depth and number of samples obtained for each site was dependent upon the depth of topsoil and apparent layer changes within it.

Amendment b 12/19/83

SUMMARY OF SOIL SAMPLES OBTAINED IN PANEL "C" BY CHEVRON PERSONNEL

MAY, 1983

SAMPLE SITE	DEPTH INCHES	*TEXTURE	LIME	pH	ECe	P	K	NO_3-N	% ORGANIC CARBON	**SP	meg/100 g Nh_4 OAc Mg	Na	SAR	H_2O Sol. meq/l Na	Ca+Mg
C1	5	Sil	++	7.9	0.5	12.0	90	8.3	1.50	40	1.85	0.17	0.5	0.82	4.6
C2	4	Sil	++	7.8	0.5	11.0	75	8.2	2.02	43	2.31	0.16	0.4	0.60	4.8
IC3	4	Sil	++	7.9	0.5	8.1	133	7.9	1.90	44	4.04	0.17	0.4	0.56	4.7
C4	2	Sil	+	7.9	0.4	19.0	165	2.8	2.92	50	2.16	0.19	0.1	0.10	4.2
C4	4	Sil	++	7.9	0.4	5.5	94	1.0	2.68	55	2.70	0.16	0.5	0.81	4.4
C4	6	Sil	++	7.9	0.4	11.0	122	2.4	2.78	47	2.57	0.15	0.5	0.65	4.1
C5	3	Sil	+	7.6	0.5	8.7	82	6.8	1.28	35	2.44	0.13	0.4	0.59	4.5
C6	8	Sil	+	7.6	0.4	10.0	120	4.9	1.39	40	2.16	0.15	0.4	0.52	4.2
C7	12	Sil	++	8.0	0.5	9.0	88	8.3	1.90	48	1.31	0.15	0.4	0.56	4.6
C8	8	Sil	++	7.9	0.4	4.9	74	6.3	1.62	44	1.75	0.17	0.4	0.53	4.3
C9	3	Sil	+	7.8	0.6	14.0	100	10.0	1.71	40	1.60	0.12	0.6	0.87	4.9
C10	4	Sil	++	8.0	0.3	9.8	70	1.1	2.03	48	4.35	0.14	0.5	0.60	2.8
C11	4	Sil	++	7.9	0.5	6.3	93	6.2	1.62	47	3.42	0.19	0.6	0.99	4.7
C11	6	Sil	+	7.2	0.7	27	286	30.0	3.09	59	3.01	0.17	0.1	0.09	6.2
C11	8	Sil	+	7.6	0.5	9.5	108	5.7	1.43	46	3.01	0.33	0.6	0.95	5.[illegible]
C11	18	Sil	+	7.7	0.4	9.9	114	7.5	1.74	45	3.29	0.17	0.4	0.59	4.[illegible]

*Sil = Silt Loam,
** SP = Saturation Percentage

Note: Depth and number of samples obtained for each site was dependent upon the depth of topsoil and apparent layer changes within it. Sample sites are noted on figure 10.

Amendment c 12/19/83

GRAB SAMPLES FROM PANEL "C"
COLLECTED BY NATIVE PLANTS, INC., MARCH 1982

meq/l

	pH	$CaCO_3$ Equiv. (%)	NO_c-N (%)	PO_4-P (ppm)	Ca	Mg	Na	K	SAR	Organic Carbon (%
Panel C - Stockpile TS	7.82	34.11	0.145	1.72	6776.4	4425.8	196.6	409.2	2.63	0.17
McIntyre Tongue	8.17	29.56	0.095	0.25	5069.9	7346.2	313.6	884.9	3.35	0.11
Undisturbed Topsoil	7.77	9.10	0.105	2.36	1362.3	1011.8	123.1	593.3	2.85	0.51
Grey Subsoil	7.97	54.58	0.036	0.74	12455.0	7716.4	60.9	104.8	0.61	0.05
Limestone	8.07	75.04	0.025	1.95	12420.2	12602.8	16.1	43.0	0.14	0.04
Yellow Shale	8.22	27.29	0.015	0.86	4346.3	4072.1	53.9	787.7	1.19	0.04
Regular Topsoil	7.80	4.55	0.370	2.40	1876.2	847.3	145.3	514.0	3.94	0.62

Note: No lab sheet available

Revised 12/19/83